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A ROOT GALL ON RADISH CAUSED BY *ALBUGO CANDIDA* (PERS.) KUNTZE

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[Read 11 December 1952]

In April 1952, specimens of radish (*Raphanus sativus L.*) variety Long Scarlet were submitted to the Plant Research Laboratory, Burnley, for diagnosis of a root-gall condition. The plants were grown at South Warrandyte, Victoria.

Symptoms and Etiology

A gall, slightly paler in colour than the root and measuring approximately 1·5 to 2 cm. in diameter (Pl. III, fig. 1) was formed on one side of the tap-root of diseased plants, just below soil level.

Freehand sections taken through one of these galls were stained with cotton-blue dissolved in lacto-phenol (Smith 1938, p. 234).

Microscopic examination of these sections revealed an abundance of resting spores embedded in the superficial tissue of the gall. Some of the spores were immature and in association with these, oogonia measuring 56μ x 50μ, together with antheridia measuring 17·5μ x 25μ were found (Pl. III, fig. 2). When mature the oospores measured 40 to 48μ diameter, and the thick yellow walls were conspicuously roughened. In the interior of the gall, although no oospores were found, intercellular hyphae (approximately 4μ diameter) bearing small, globular haustoria, 4 to 5μ diameter were abundant (Pl. III, fig. 5).

Discussion and Conclusions

In Europe, in 1932, a similar type of root swelling was recorded on the Icicle variety of radish, when Laubert (1932) identified the pathogen responsible, as *Cystopus candidus* (Pers.) Lév. The only other record of this fungus on radish roots is a very meagre and somewhat doubtful one. In 1899, Beck (1899) referred briefly to *Cystopus candidus* in association with *Peronospora brassicae,* on red radish grown in Czecho-slovakia. In this instance a canker-like symptom was attributed to *Cystopus candidus,* but the fungus itself was so inadequately described that its identity is open to question.

In the present example, although the oospores are slightly larger than those of the type-specimen of *Cystopus candidus* (Saccardo 1888, p. 234), in other respects, such as colour and markings of the outer wall, the spores are identical. Also, further evidence for identifying the pathogen with *Cystopus candidus* is provided by the abundant development of small globular haustoria (Pl. III, fig. 5), which arise laterally on the hyphae.

The generic name *Cystopus,* however, according to the rules of priority in nomenclature, should be replaced by the older name *Albugo* (Bessey 1950, p. 135) and the gall-forming pathogen now described on radish is named *Albugo candida* (Pers.) Kuntze.

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This is the first time in Australia that a root-swelling symptom has been associated with *Albugo candida* infection of radish.

In the asexual stage of its development, *Albugo candida* produces leaf symptoms known as 'white rust' which occur quite commonly on radish grown in this country. However, this symptom was not observed on the Warrandyte specimens. When submitted for examination, the plants were almost completely devoid of leaves, having been severely attacked by the cabbage butterfly, *Pieris rapae* L. Furthermore, the contributor of the specimens did not notice any sign of 'white rust' during the growing season of these plants. If this symptom was indeed entirely absent it would appear that, in this instance, the asexual stage did not occur in the life cycle of the pathogen.

Bibliography

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Explanation of Plate III

Illustrating radish root infected with *Albugo candida.*
Fig. 1.—Root with gall. Natural size.
Figs. 2-5.—Sections of gall showing morphology of pathogen.
Fig. 2.—Oogonium and antheridium x 450.
Fig. 3.—(above), Ripening oospore surrounded by wall of oogonium; (below), mature oospore with associated antheridium x 400.
Fig. 4.—Mature oospores x 400.
Fig. 5.—Intercellular hypha bearing numerous globular haustoria x 400.